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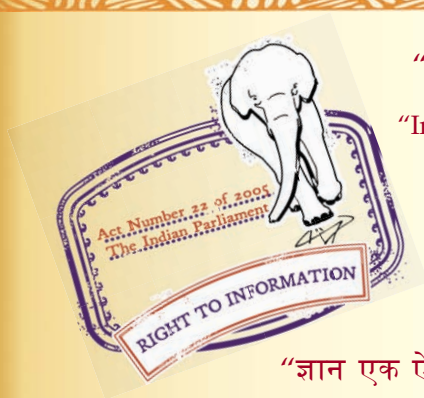
“The Right to Information, The Right to Live”

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“Step Out From the Old to the New”

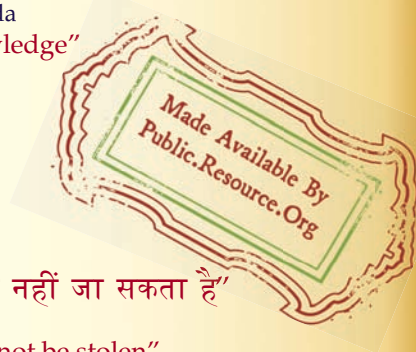
IS 4329 (1967): Measuring (Traveling) Microscope [PGD 22: Educational Instruments and Equipment]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 4329 - 1967

Indian Standard
**SPECIFICATION FOR
MEASURING (TRAVELLING) MICROSCOPE**

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**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

Indian Standard

SPECIFICATION FOR MEASURING (TRAVELLING) MICROSCOPE

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AMENDMENT NO. 2 SEPTEMBER 1982

TO

IS:4329-1967 SPECIFICATION FOR MEASURING
(TRAVELLING) MICROSCOPE

Alterations

(Page 3, clause 1.1) - Substitute the following for the existing clause:

'1.1 This standard covers the general and functional requirements of measuring (travelling) microscope with either one or two scales (one horizontal and other vertical).'

(Page 3, clause 2.1) - Substitute the following for the existing clause:

'2.1 Base - The horizontal part over which moves either a horizontal carriage carrying the microscope body or a horizontal carriage carrying the vertical pillar which carries the microscope body.'

(Page 4, clause 2.4) - Substitute the following for the existing clause:

'2.4 Horizontal Carriage - The part which slides along the bed and carries either a vernier and a microscope tube assembly or a vertical column with vernier and a microscope body.'

(Page 4, clause 4.2) - Substitute the following for the existing clause:

'4.2 The instrument shall be so designed that each carriage moves smoothly in its guide-ways through its full range.'

(Page 4, clause 4.6) - Substitute the following for the existing clause:

'4.6 Microscope tube may be attached to either the horizontal carriage or the vertical carriage having a swivelling arrangement in horizontal as well as vertical plane.'

(EDC 36)

Indian Standard

SPECIFICATION FOR MEASURING (TRAVELLING) MICROSCOPE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 October 1967, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Measuring (travelling) microscope is a low magnification compound microscope sliding over graduated horizontal and vertical scales and used for linear measurements.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the general and functional requirements of measuring (travelling) microscope.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions and the definitions given in IS : 1399-1959† shall apply.

2.1 Base — The horizontal part over which moves the horizontal carriage carrying the vertical pillar.

2.2 Bed — A machined part of the base or a separate attachment rigidly fixed on the base on which the horizontal carriage moves.

2.3 Consistency of Reading — The characteristics of the horizontal and vertical carriages of the microscope to set themselves each time to their original positions throughout their full ranges when such settings are disturbed and restored.

*Rules for rounding off numerical values (revised).

†Glossary of terms used in optical technology.

IS : 4329 - 1967

2.4 Horizontal Carriage — The part which slides along the bed and carries the vertical column with vernier.

2.5 Stage — A platform rigidly fixed to the base on which measurements are carried out.

2.6 Vertical Carriage — The part which slides along the vertical pillar and carries the microscope tube assembly with vernier.

3. DIMENSIONS

3.1 The dimensions for measuring (travelling) microscope shall conform to IS : 3081-1965*.

4. GENERAL REQUIREMENTS

4.1 The base of the microscope shall be of a suitable material and shall be sufficiently heavy to ensure stability during manipulation.

4.2 The instrument shall be so designed that both carriages move smoothly in their guide-ways through their full ranges.

4.3 The instrument shall have three points support of which at least two shall be provided with levelling screws.

4.4 A circular bubble or tee bubble shall be suitably provided for quick levelling of the instrument.

4.5 The vertical and horizontal carriages shall be provided with engaging screws by which the carriages may be engaged to the fine motion mechanism.

4.6 The microscope tube shall be attached to the vertical carriage having a swivelling arrangement in a vertical plane.

4.7 Graduations of scales and verniers shall be fine and uniform in height and thickness. The divisions shall have good contrast to the background when viewed through the magnifier.

4.8 The microscope shall be provided with rack and pinion focusing arrangement with suitable guide. This arrangement shall be such that it is smooth and there is no appreciable backlash or movement of the body tube under gravity.

4.9 Materials for scale and vernier shall be corrosion resistant and non-tarnishing type and shall not have a co-efficient of linear expansion more than 0.000 02 per degree Celsius.

*Dimensions and marking of general purposes microscopes.

AMENDMENT NO. 1 DECEMBER 1979
TO
IS:4329-1967 SPECIFICATION FOR MEASURING
(TRAVELLING) MICROSCOPE

Corrigendum

(Page 5, clause 5.2, line 1) - Substitute '4.2'
for '2.2'

Alterations

(Page 5, clause 5.4, line 4) - Substitute
' $27 \pm 2^{\circ}\text{C}$ ' for ' 20°C '.

(Page 7, clause 6.8, line 2) - Substitute
'0.01 mm' for '0.02 mm'.

(EDC 36)

Reprography Unit, ISI, New Delhi

4.10 Materials for optical components shall conform to IS : 988-1959* and IS : 1400-1960†.

4.11 Bubble shall conform to IS : 1632-1960‡.

4.12 Material for all other components shall be chosen with particular regard to their functions and shall be free from flaws and defects.

4.13 The workmanship and finish shall conform to IS : 2754-1964§.

5. FUNCTIONAL REQUIREMENTS

5.1 The stage shall be so fixed that it is horizontal when the instrument is levelled and that the line of movement of the microscope axis in its vertical position passes through the centre of the stage.

5.2 The objective shall be made to conform to 2.2 of IS : 2754-1964§. It shall have a minimum working distance of 25 mm and magnification $2\times$ to $4\times$. Numerical aperture of the objective shall not be less than 0.06.

5.3 The microscope tube shall receive the eyepiece at its upper end. The eyepiece shall be of the Ramsden type with a magnification of $10\times$ or lower and fitted with a 90° cross-wire or cross line graticule. The bore diameter of the tube and the outer diameter of the eyepiece shall conform to IS : 3081-1965||.

5.4 The width of the scale divisions shall not be more than one-tenth of the line spacings and vernier divisions shall not vary in width from those of the scale by more than 5 percent. Graduations of scale and vernier shall be done at standard temperature of 20°C .

5.5 Error between any two graduations in the scale shall not exceed by 0.01 mm.

5.6 The vertical and horizontal ranges of measurement shall be 150 mm and 200 mm respectively with an accuracy of 0.01 mm.

5.7 Magnifiers shall be provided for reading the scales and shall have a magnification of $5\times$.

5.8 Traverse of the fine motion shall not be less than 10 mm.

5.9 Least count of the vernier shall be 0.01 mm.

5.10 The mechanical tube length of the microscope shall be within ± 1 mm of its nominal value of 160 mm. The outer diameter of the tube shall conform to IS : 3081-1965||.

*General requirements for optical components.

†Specification for optical glass.

‡Specification for bubbles.

§General requirements for optical instruments.

||Dimensions and marking of general purposes microscopes.

IS : 4329 - 1967

5.11 The adjustment of the perpendicularity of the vertical pillar to the plane of movement of the horizontal carriage shall be carried out with care and shall be maintained within 10 minutes when the instrument is levelled.

5.12 Index marks shall be provided to set the microscope in vertical and horizontal positions within an accuracy of one degree. These lines shall be as fine as possible and not more than 5 mm in length.

5.13 The microscope axis shall be parallel to the vertical line of movement when set in the vertical position within an accuracy of one degree.

6. TESTS

6.1 Stage of the microscope shall be tested for horizontality with the help of another spirit bubble of 30 second accuracy. The stage shall be levelled when the instrument is levelled with the help of its own bubble.

6.2 Magnification — The magnification of the microscope objective shall be measured by the method given in Appendix J of IS : 2754-1964*. The measured value shall not differ from the specified value by more than 5 percent.

6.3 Numerical Aperture — The numerical aperture of the objective shall be tested as per 4.2.3 of IS : 2754-1964*.

6.4 Resolving Power — The resolving power of the objective shall be measured by the method given in Appendix K in conjunction with 4.2.4 and 4.2.6 of IS : 2754-1964*.

6.5 The plane of the movement of horizontal carriage shall be horizontal when the instrument is levelled. This shall be tested by a microslide with thin structures mounted on it. In one position of the stage the same is focused by microscope having its axis vertical. In different positions of the horizontal carriage on its bed, the structures should remain in focus without any manipulation of the vertical movement of the microscope.

6.6 The verticality of vertical movement shall be tested with the help of a plumb line. The plumb line shall be made of a fine wire of 0.2 mm diameter. The instrument under test shall be levelled with the microscope axis horizontal, it shall be so oriented that the microscope is focused on the plumb line. By suitable manipulations, the image of the line is brought in the centre of the field and one of the cross-wires is brought in the middle of the image of the plumb line. The microscope is traversed along its vertical guide-ways. In all the positions the image of the line shall remain in focus without disturbing the focusing mechanism of the

*General requirements for optical instruments.

microscope and the cross-wire shall not cross either of the two edges of the image of the line.

6.7 The consistency of reading shall be tested by the same set up as described in **6.4**. The procedure may be given as under.

6.7.1 The cross-wire shall be brought in coincidence with either of the two edges of the image of plumb line. The reading on both the scales shall be taken. First, keeping the vertical carriage in position, the horizontal carriage may be displaced and brought again to the original position by checking the reading on the horizontal scale. The image of the line shall remain in focus and at the same time shall not shift in position appreciably. Secondly, keeping the horizontal carriage in position, the vertical carriage may be displaced and brought back to the original position again by checking with the vertical scale reading. Here again, the image of the line shall remain in focus and shall not shift in position appreciably. Such tests shall be carried out for minimum three different positions of both the carriages.

6.8 Operation of the fine motion mechanism through its full range shall not appear to displace an object by more than 0.02 mm.

7. MARKING

7.1 Each microscope shall be marked at a suitable place with the manufacturer's name or trade-mark and the serial number. If desired by the purchaser, the microscope may also be marked with the year of manufacture.

7.2 The objective and eyepiece shall be marked according to IS : 3081-1965*.

7.3 BIS Certification Marking

The product may also be marked with Standard Mark.

7.3.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

*Dimensions and marking of general purposes microscopes.

IS : 4329 - 1967

8. PACKING

8.1 The instrument shall be supplied in a convenient wooden case, suitably padded and fitted with proper supports at various points.

8.2 The instrument in its case shall be suitably packed for transit.

8.3 The package shall be marked with the standard symbol for indicating fragile contents according to IS:1286-1967*, together with the legend 'INSTRUMENT, HANDLE WITH CARE' in red and the symbol for 'THIS-WAY UP'.

*Pictorial markings for handling of goods in general (*first revision*).

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